

PREFINAL REPORT
for the
ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP), EUROPE
at the
PIRMASENS MILITARY COMMUNITY
VOLUME 1: EXECUTIVE SUMMARY

Prepared for:

Department of the Army
European Division, Corps of Engineers
AEC NY 09757

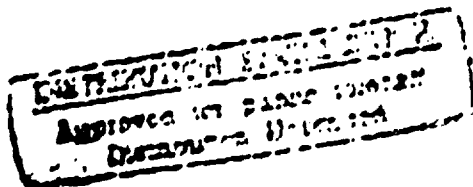
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SECTION I

EXECUTIVE SUMMARY

1.1 INTRODUCTION

Contract No. DACA 90-81-C-0072 directs that a basewide energy study be accomplished for the Mannheim and Pirmasens Military Communities, Federal Republic of Germany. The project is identified as Energy Engineering Analysis Program (EEAP) Package No. 5.

The overall objective of the study is to produce a systematic plan of improvement projects that will reduce by 1985 the energy consumption in compliance with the Army Facilities Energy Plan without decreasing the readiness posture of the Army.

The following installations within the Pirmasens Community were included in this study:

<u>Installation No.</u>	<u>Designation</u>
GY-340	Muenchweiler Hospital
GY-450	Fishbach Ord Depot
GY-472	Hessweiler UG Storage
GY-533	Neuhuehlbach Railhead

The study is conducted in three phases, namely:

- Phase I - The gathering of data and inspection of the facilities in the field. This phase included visits to the 4 different installations during which 68 of approximately 83 facilities were examined. The gathering of data involved the taking of notes and making tape recordings of findings, photographing of facilities (where permitted), the collection of available plans and records, and conferences with EUD and Community facility engineering personnel.

The survey revealed that some of the selected buildings had little or no energy use, or were not representative of the facilities in the installation. As a result, certain buildings were deleted. Others were added which were deemed necessary for an accurate energy consumption of each installation to be developed. A final figure of 63 buildings resulted from this process.

The information gathered during the survey has been consolidated and included in the Preliminary Submittal made at the completion of this phase. Included in the report are listings of potential energy conservation measures which were developed as a result of the field survey.

- Phase II - The analysis of the collected data permitted the calculation of the existing energy consumption of the selected facilities within each installation; and the calculation of the energy savings due to the implementation of proposed Energy Conservation Measures (ECMs). These values are extrapolated to the remainder of the facilities to develop installation-wide and community-wide energy consumptions, energy savings, and proposed FY85 energy use.

Each Energy Conservation Measure (ECM) was evaluated in accordance with Energy Conservation Improvements Program (ECIP) criteria to determine its economic feasibility. ECM Projects from Increments A and B are divided into ECIP Projects, Increment G Projects, and Increment F Projects. This Report includes the ECIP Projects, and Increment G Projects. The Increment F Projects are included in a separate report.

The ECIP Projects are ranked according to SIR (Savings Investment Ratio) value.

- Phase III - The Prefinal and Final submissions of this report covers the work of this phase.

The Prefinal submission consists of an addendum to the Interim submittal, a revised Executive Summary, and complete IRI's for the five ECIP projects developed for the Pimasans Community. Following the receipt of comments on the Prefinal submission, a complete Final Report will be submitted.

SECTION 2

EXISTING ENERGY CONSUMPTION

2.1 FY75 BASELINE ENERGY CONSUMPTION

The energy consumption for FY75 for those installations of the Pirmasens Military Community covered by this study was:

Electricity	5,730,700 kWh
No. 2 Fuel Oil	400,000 Gal.
Bituminous Coal	5,525 Metric Tons

These values were provided by the Pirmasens Community. Figures 2.1 and 2.2 present energy consumption for No. 2 Fuel Oil and Bituminous Coal's for the entire Pirmasens Community.

2.2 SOURCE ENERGY CONSUMPTION

Table 2.1 presents the source energy consumption by fuel type for FY79, FY80, and FY81 for only the installations included in this study. The values in Btu were developed using the following energy conversion factors.

Electricity	11,600 Btu/kWh
Distillate Fuel Oil (No. 2)	138,700 Btu/Gal.
Bituminous Coal	27,094,000 Btu/Metric Ton

The conversion factors for electricity and No. 2 Fuel Oil were taken directly from the energy conversion factors in the ECIP Guidance. The Bituminous Coal values were obtained by converting the figures in the ECIP Guidance to metric tons. Energy costs were developed using the conversion factor of 2.26 D Mark/\$ as directed by EUD.

ELECTRICAL ENERGY COST

Throughout the report, 11,600 Btu/kWh has been used as the conversion factor from kilowatt hours to Btu. As a result, energy savings (MBtu) are in terms of "source" energy. Unit energy costs (\$/MBtu) also are in terms of source energy.

If "load" energy is used as a basis for energy savings - then 3,414 Btu/kWh is the conversion factor. When load energy is considered, the magnitude of energy savings is decreased, but the unit cost (\$/MBtu) is increased proportionally. The result is that the energy cost savings using "source" or "load" energy is the same for both methods. The following example illustrates this point:

Electricity Savings = 5,000 kWh

• Source Energy Method:

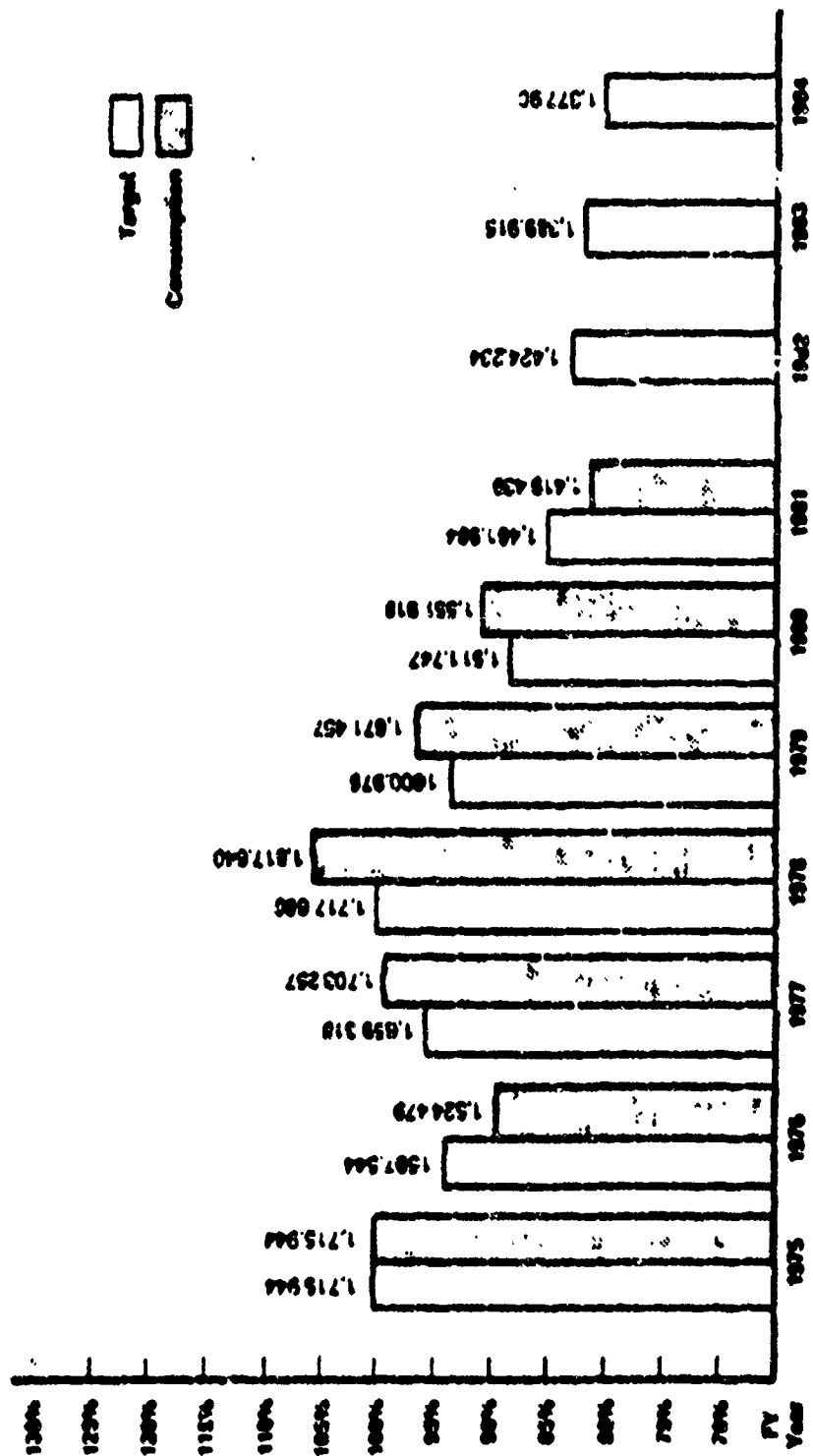
$$\text{Energy Savings} = 5,000 \text{ kWh} \times \frac{11,600 \text{ Btu}}{\text{kWh}} \times \frac{1 \text{ MBtu}}{10^6 \text{ Btu}} = 58 \text{ MBtu}$$

$$\text{Energy Cost Savings} = 58 \text{ MBtu} \times \$4.15 / \text{source MBtu} = \$241$$

• Load Energy Method:

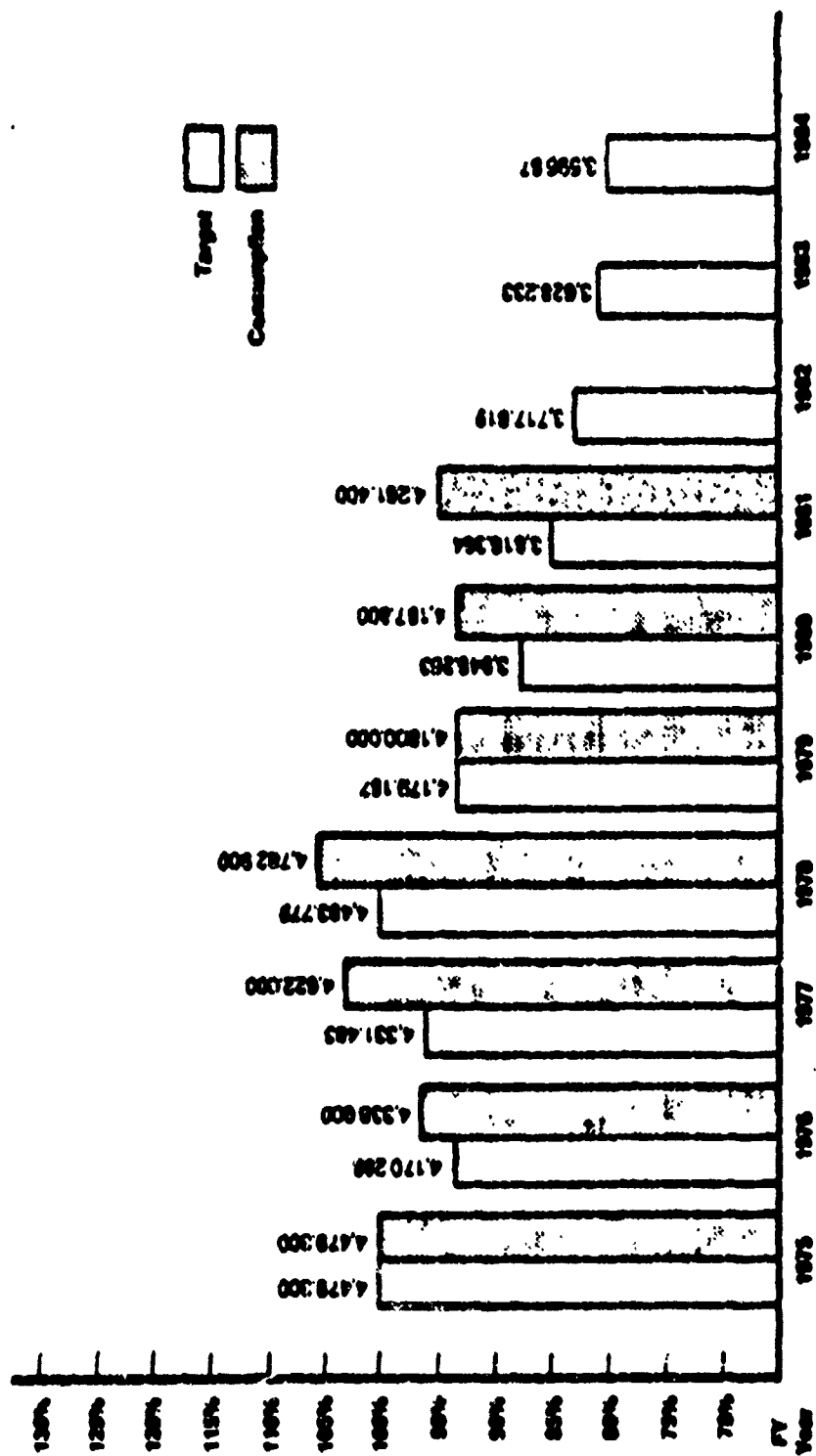
$$\text{Energy Savings} = 5,000 \text{ kWh} \times \frac{3,414 \text{ Btu}}{\text{kWh}} \times \frac{1 \text{ MBtu}}{10^6 \text{ Btu}} = 17.1 \text{ MBtu}$$

$$\text{Energy Cost Savings} = 17.1 \text{ MBtu} \times \$14.09 / \text{load MBtu} = \$241$$



(Community Wide Consumption)

FIGURE 2.1 TARGET AND CONSUMPTION #2 FUEL OIL IN GAL



(Community Wide Consumption)
 FIGURE 2.2 TARGET AND CONSUMPTION BITUMINOUS COAL IN M/Tc.

TABLE 2.1

SCALE EFFECT CONSUMPTION 1979, 1980, 1981
 (U.S. and Foreign Consumption Included in Data Studies)

Commodity	1979		1980		1981	
	Quantity	Cost (\$)	Quantity	Cost (\$)	Quantity	Cost (\$)
Electricity (MWh)	5,150,680	331,377	7,027,074	343,330	7,027,074	343,330
Gasoline (1000 bbl)	937,000	410,015	377,321	305,033	377,321	305,033
Domestic Coal (100 tons)	9,000	100,000	113,35	100,000	113,35	100,000
TOTALS		831,392		748,363		748,363

2.3 TOTAL ANNUAL ENERGY CONSUMPTION

The annual source energy consumption for the 4 installations in this study as shown on Table 2.1 is:

FY79 - 256.83×10^9 Btu
FY80 - 252.01×10^9 Btu
FY81 - 249.53×10^9 Btu

If these figures are related to the FY75 baseline energy consumption of 277.16×10^9 Btu, it is noted that the FY79 consumption is 92.7% of FY75, FY80 consumption is 90.9% of FY75, and FY81 consumption is 90.0% of FY75.

It should also be noted that FY80 energy consumption was 1.8% less than FY79; and FY81 was 2.8% less than FY79.

2.4 BUILDING GROUP SOURCE ENERGY CONSUMPTION

Table 2.2 presents the energy consumption by building group type for each installation in this study. These summaries were extracted from the computer printouts contained in Volume 4, Section 4 of this report.

2.5 TYPICAL BUILDING ENERGY CONSUMPTION

Table 2.3 presents values for typical building energy consumption for each of the 13 building group types shown in Table 2.2. Values are given in units of MBtu/yr per square foot (ft^2) of floor area. Values for MBtu/yr were obtained from the Totals column of Table 2.2. The individual buildings included in each building group are listed in the Volume 4 computer printouts, and floor areas are from the building list contained in Section 9 of the main report, Volume 11.

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TABLE 2.3

TYPICAL BUILDING ENERGY CONSUMPTION

Building Group Type		Total Annual		Total Bldg. Floor Area (ft ²)	Typical Energy Consumption (Btu/yr per ft ²)
Type No.	Description	Energy Consumption (From Table 2.3) (MMBtu/yr)	No. of Bldgs.		
10	Barrack	51,260	16	333,743	153,591
20	Chapel	979	2	8,679	107,040
30	Exchange	1,292	1	7,726	167,227
40	Family Housing	19,282	4	78,438	245,825
50	Gymnasium	1,820	1	13,230	137,528
60	High Bay Shop	464	1	4,799	96,687
70	Hospital	7,441	4	68,756	108,223
80	Mess Hall	4,491	2	38,681	116,104
90	Office	1,212	3	7,958	152,300
100	School	1,535	2	16,738	91,707
110	Shop	4,800	9	30,434	157,718
120	Warehouse	7,473	4	69,703	105,546
130	Others	5,283	7	39,862	132,532
TOTALS:		107,282	56	718,747	149,263

NOTE: Total does not include building 7154 which has a lot of equipment, and is not typical of the other shops.

SECTION 3

ENERGY CONSERVATION MEASURES DEVELOPED

3.1 ENERGY CONSERVATION MEASURES INVESTIGATED

A list of Energy Conservation Measures (ECM's) to be investigated is contained in ANNEX A of the EEAP Scope of Work. This list, along with previous energy conservation retrofit experience, and the observations and data obtained from two site visits, provided a basis for a list of ECM's to be quantitatively analyzed.

For increments A, B, G the ECM's involved are:

Building Shell:

- Wall insulation
- Roof & attic insulation
- Storm windows
- Energy efficient windows
- Weatherstrip windows
- Weatherstrip personnel doors
- Weatherstrip vehicular doors
- Reduce window area
- Translucent insulating panels
- Entrance vestibules
- Replace vehicular door with wall
- Caulking

Heating and Ventilating:

- Destratification
- Ventilating type hoods
- Radiator thermostatic control valves
- Heat Recovery
- Pipe insulation

Domestic Hot Water:

- Flow restrictors

Electrical:

- Interior lighting conversions
- Exterior lighting conversions
- Delamping
- Photocell switches

Central Plant & Distribution Systems (Increment B)

- Hot water vs. steam boilers
- Boiler trim controls
- Heat Recovery from boiler blowdown
- EHCS
- Boiler economizers

In Chapter 10 of the Main Report (Volume II) a dot matrix is included showing the buildings at each installation for which the ECM was applicable and was analyzed. The matrix also includes whether the ECM was economically feasible ($SIR > 1$) and was developed into an ECIP Project or was not ($SIR \leq 1$), or was developed into an Increment G project (none were).

Other ECM's analyzed are included under Increment F. Refer to that separate volume. Most of those are analyzed on a unit basis for use by Facilities Engineer (FE) personnel to develop projects. Refer to Tables G-1 and G-2 in Section 6 for a summary of these projects. ECM's listed in Annex A which were not analyzed, were either not applicable, already implemented, or are scheduled to be implemented. The status of each Annex A ECM is discussed in Section 10 of the Main Report (Vol. II).

The results of the analysis of each ECM are presented in Table 3.1 (2 pages). Results for individual buildings are included with the ECM section in Appendix Volume III B.

3.2 ECIP PROJECTS DEVELOPED

Table 3.2 presents a summary of all the ECIP Projects. These 5 projects are comprised of discrete ECM's all of which have $SIR > 1$. The grouping of ECM's to produce ECIP Projects as shown is tentative, and is presented for review and modification as desired by the Facilities Engineer.

3.3 OTHER ENERGY CONSERVATION PROJECTS

Increment G Projects are formed from ECM's which do not meet ECIP criteria, namely, ESIR value less than 1 and are above the FE funding limits of \$500,000 for new and alteration type work, and \$200,000 for O & M type work. None of the projects investigated fell into this category i.e., there are no Increment G Projects. Refer to Section 10 of Part B of the Main Report (Volume II) for a complete discussion of the differences between Increments A, B, G, F, and ECIP Projects.

Increment F Projects (refer to Section 6) were analyzed mostly on a unit basis, for development into desired projects by the Facilities Engineer.

3.4 POLICY CHANGES/RECOMMENDATIONS

During the site visits, the Facility Engineering personnel for the Community and the Installation Coordinators at the various installations were interviewed to develop an overview of the energy conservation policies in effect and their effectiveness in reducing energy consumption.

TABLE 3.1 (p. 1 of 2)

FINANCIAL PERFORMANCE
EIA ANALYSIS SUMMARY

EIA Project Item	Description	ANNUAL ENERGY SAVINGS (BTU)		Annual Energy Cost Savings (\$/yr)	Total Cycle Cost Savings (\$)	Total Project Cost (\$)	Simple Payback (Yrs.)	SIR
		Full	Net					
BUILDING ENVELOPE								
Wall Insulation		540.1		989.5	47,540	3,200	6.8	34.8
Roof & Siding Insulation		835.9		989.5	1,240,500	234,800	2.4	5.5
Window Windows		1413.8		11,433.8	625,000	325,700	5.8	2.5
Low-E Window Treatments		242.8		2,493.4	407,800	810,270	29.5	0.5
Weatherstripping Windows		15.7		39.6	211,900	31,800	2.2	6.7
Weatherstripping External Doors		155.6		38.8	3,700	630	2.5	6.2
Weatherstripping Internal Doors		375.0		129.8	34,800	4,950	4.0	3.0
Sealed Windows Data		19.2		1.6	38,210	18,250	5.7	2.1
Weatherstripping External Windows		6.4		45	1,545	1,655	17.2	0.9
Weatherstripping Internal Windows		740.1		248.0	511	2,400	64.0	0.2
Weatherstripping External Windows				801.8	19,920	10,500	6.5	1.8
Weatherstripping Internal Windows				3,279	50,400	5,507	1.1	34.4
MECHANICAL SYSTEMS								
Boiler and Water Heating		1,405.6		245.0	140,140	21,670	1.2	6.5
Boiler and Water Heating		1,130.7		7,830	80,200	28,570	3.5	3.3
Boiler and Water Heating		1,000.0		7,375	874,500	161,750	2.1	5.4
Boiler and Water Heating		2,110.0		605.0	567,310	64,900	1.7	8.2
Boiler and Water Heating		4,550.0		4,550.0	509,300	206,100	16.2	1.1
Boiler and Water Heating		874.0		2,493.9	217,600	23,210	1.5	9.4
Boiler and Water Heating		4,711.8		19,830	218,050	89,850	4.5	2.4
Boiler and Water Heating		4.7		50	4,450	2,550	7.6	1.4
Boiler and Water Heating		451		1,875	20,400	205	0.5	64.1
Boiler and Water Heating		54.1		716	4,300	5,750	15.0	0.7

TABLE 3.1 (p. 2 of 2)

ECN ANALYSIS SUMMARY
PROPOSED MILL/MT (REVENUE)

ECN PROJECT NAME	ELECTRICITY	FUEL OIL	BITUM. COST	TOTAL	ANNUAL ENERGY COST \$/MT	TOTAL LIFE CYCLE COST DISCOUNTED (\$)	TOTAL PRODUCTS COST (\$)	SAMPLE PAYABLE (YRS.)	SIR
ECN Plant Disposal									
ECN WASTE vs. SIR		162.0	406.0	640.0	3.133	43,560	370,400	121.0	0.1
ECN Plant (Current)		375.0	4107.0	4532.0	19.740	293,400	72,500	3.7	0.3
ECN Plant (Future)			1337.0	1337.0	3.426	84,430	11,710	2.1	0.2
ECN			1743.0	1743.0	7.159	109,730	295,700	43.2	0.4
ECN (Current)		1611.0		1611.0	11.950	179,300	790,000	69.4	0.2

NOTE: ECN's FOR WHICH SOME OF THE DISCOUNTED ANALYZED WERE ECONOMICALLY VIABLE (SIR > 1) ARE INDICATED BY ***. FOR THESE ECN'S THE
VALUES REPORTED INCLUDE ONLY THE DISCOUNTED SIR > 1.

TABLE 3.2

IP Project Name	Electricity	Annual Energy Savings (MMBtu/yr)		Annual Energy Savings (\$)	Total	100 Cycle Cost Pay Discounted Savings (\$)	Simple Payback Cost (\$)
		22 Feet On	Bitumen Cool				
01	0.7077	6315.9	9044.5	98,000	17410.4	1,740,500	631,270
02	(4771.8)	9629.5	5470.7	74,720	14091.9	938,360	213,060
03	(246.2)	(1138.7)		(119,800)	(4771.8)	(218,830)	(99,720)
04		(854.8)	(2369.9)	(1,030)	(857.5)	(80,700)	(29,270)
05	(1-273.6)	(1504.6)	(363.8)	(115,730)	(1223.3)	(217,660)	(23,210)
06	(92.7)			(111,790)	(1272.8)	(140,140)	(16,53)
07		(292.8)	(2795.4)	(114,310)	(2706.2)	(4,230)	(2,140)
08	(15.7)	(39.6)		(260)	(55.5)	(5,740)	(610)
09	(153.6)	(38.8)		(1,250)	(152.4)	(18,800)	(4,950)
10		(599.1)		(4,170)	(548.1)	(47,570)	(10,130)
11		1033.8	11703.9	56,738	12737.6	625,008	321,740
12		3019.6	12538.0	151,570	26710.0	1,928,270	947,560
13		(540.0)	(129.8)	(3,176)	(540.8)	(46,230)	(2,11)
14		(248.0)		(1,753)	(248.0)	(19,920)	(4,360)
15			(881.8)	(3,273)	(881.8)	(50,466)	(14,43)
16		(2022.0)		(176,975)	(10208.0)	(874,500)	(161,770)
17		(2740.0)		(141,940)	(8375.0)	(567,900)	(62,900)
18		(335.0)		(119,760)	(4554.0)	(255,000)	(72,500)
19			(337.0)	(3,006)	(1337.0)	(94,430)	(11,710)
20			6280.0	70,100	4970.0	509,300	206,100
21		7850.0	43010.0	190,670	70530.0	5,241,460	1,827,530
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SECTION 4

ENERGY AND COST SAVINGS

4.1 BASE-WIDE CONSUMPTION AFTER ENERGY CONSERVATION PROJECTS

As presented in Table 4.1, the FY81 source energy consumption for the four installations of the Pirmasens Community in this study was 249,550 MBtu. The implementation of the proposed five ECIP Projects will result in an annual energy savings of 76,590 MBtu/year. Energy consumption would be 172,960 MBtu/yr. This represents a 30.7% reduction in energy use.

As also presented in Table 4.1, the annual energy cost for the four installations in this study at Pirmasens in FY81 was \$1,164,400. The energy cost savings resulting from the ECIP Projects is \$398,610. The energy cost after implementing the ECIP Projects will be \$765,780. This represents an energy cost reduction of 34.2%.

4.2 ALLOCATION OF ENERGY CONSERVATION PROJECT SAVINGS

Table 3.2 presented a breakdown of the energy savings by ECIP Project. A more detailed breakdown of savings by ECM and building is contained in Volume IV (Bundles).

4.3 PROJECTED ENERGY CONSUMPTION

As stated above, annual energy consumption for these four installations will decrease by an estimated 76,590 MBtu/yr from 249,550 MBtu/yr to 172,960 MBtu/yr following the implementation of the proposed ECIP projects.

4.4 PROJECTED ENERGY COSTS

Annual energy costs for these four installations will decrease by \$398,610/year from \$1,164,400 per year to \$765,780 per year after the implementation of these proposed ECIP projects. These predicted costs are in terms of FY81 dollars as required by the SIR analysis and does not include the general rate of inflation, or inflation of fuel costs.

TABLE 4.1

ENERGY USE AND SAVINGS SUMMARY FOR
THE 4 INSTALLATIONS INCLUDED IN THIS STUDY
PINMASENS MILITARY COMMUNITY

Fuel	<u>EXISTING: FY 81</u>		<u>ECIP PROJECT SAVINGS</u>		<u>PROJECTED AFTER ECIP</u>	
	<u>Energy Use</u> (MBtu/yr)	<u>Energy Cost</u> (\$/yr)	<u>Annual</u> <u>Energy Use</u> (MBtu/yr)	<u>Annual</u> <u>Energy Cost</u> (\$/yr)	<u>Annual</u> <u>Energy Use</u> (MBtu/yr)	<u>Annual</u> <u>Energy Cost</u> (\$/yr)
Electricity	86,889.4	\$360,590	4,397.7	\$ 19,250	82,491.7	342,340
Oil	46,487.1	328,660	28,554.5	201,880	17,932.5	126,780
Bituminous Coal	116,173.6	475,150	43,638.0	178,480	72,535.6	296,670
TOTAL	249,550.1	\$1,164,400	76,590.3	\$398,610	172,959.8	\$765,790

SECTION 5

CENTRAL BOILER PLANTS

5.1 Background

This contract does not include Increment E. However, during the meeting at EUD on 24 March 1982, Mr. Gunzel of EUD requested the study should include a brief feasibility summary of the opportunity for centralization at the communities studied.

5.2 Results and Recommendations

Contrary to the overall conclusion drawn in the Mannheim study that centralizations and upgrading be directed toward eventual tie-ins to the Municipal District hot water heating system, the Pirmasens Area facilities at Muenchweiler, Messweiler, Moehnuehlbach, and Fischbach are too isolated to utilize district heating effectively.

Thus, with the possible exception of Muenchweiler which has family housing and adjoins a small village, the installations should not be considered for district heating.

The warehouse at Moehnuehlbach has only one hot water heating boiler and thus can be no further centralized.

The caves at Messweiler have three boiler houses in relatively close proximity and are consequently a candidate for centralization. The optimum location should be the Bldg. 7287 boiler room and hot water the distributed fluid. Additional boilers and new chimney would be needed, with perhaps some boiler room expansion.

The depot at Fischbach has several small systems and could be centralized using Bldg. 7126 as the central facility.

Such centralized systems as mentioned above are often justified on such considerations as less operating labor, economics of size, etc., none of which apply to oil heating systems which operate well with little attention. In the case of coal fired systems centralization using larger boilers pays off well particularly when automatically fired.

Muenchweiler Hospital has a centralized coal fired boiler house distributing high pressure steam to thirty hot water converters in the various buildings. This system has no viable alternatives except centrally generated hot water. This option has been ruled out by WESTON in the ECM analysis of Hot Water vs. Steam in Volume 111B.

SECTION 6

INCREMENT F - FACILITIES ENGINEER CONSERVATION MEASURES

6.1 INTRODUCTION

Increment F requires the A/E to identify projects involving the modifications and changes in systems operation which are within the Facilities Engineer funding authority and management control. Included are low cost O & M (Operations and Maintenance) type projects and projects selected from Increments A, B, and G to be financed from DMA funding. It should be noted that Increment F was not a part of the initial contract, but was later added. An additional site visit was conducted in summer 1982 to gather data for each Increment.

A separate report has been submitted to meet the requirements for the Increment F Interim Submittal. Refer to that report for a complete discussion and calculations for the 21 projects developed for Increment F, and for a summary of projects from Increments A, B, and G.

6.2 SUMMARY OF INCREMENT F PROJECTS

Table 6.1 presents a summary of the 21 projects analyzed under Increment F. Refer to the Increment F report for a complete discussion and calculations of each project.

Several of the Increment F projects are analyzed on a "unit basis," i.e., per 100 ft² of ceiling area, per personnel door, per broken or missing window. This will enable Facilities Engineer personnel to develop appropriate projects on an ongoing basis using the methodology and data supplied with each project analyzed. Some projects are alternatives to others, and others are calculated only for a particular type of building use, and particular installation, but may be expanded to include other situations.

Table 6-1, refers to these unit values, and, therefore, installation and Community-wide totals are not appropriate.

TABLE 6.1

INTERIOR PROJECTS SAVINGS, COSTS AND ECONOMIC BENEFITS
 DISMANTLING MILITARY COMMUNITY

NOTE: All projects analyzed as a unit basis

Project No.	Project Name	Unit	Materials Cost (\$)	Time (hr)	Energy Cost (\$)	Consolidated Cost (\$)	Annual Energy Savings (MWh/yr)	Annual Cost Savings (\$/yr)	SIR
P-1	Repair holes in roof	Per opening	27.30	1.0	17.00	32.30	10.6	36	19.0
P-2	Cover window film opening	Per film	6.30	1.5	17.00	23.30	6.5	46	18.2
P-3	Install double glazing to skylights	Per 100 sq. ft.	200	0.0	130	330	0.5	66	0.66
P-4	Install insulated panel beneath skylights	Per 100 sq. ft.	253	20	300	553	15.6	160	1.75
P-5	Install dropped ceiling	Per 1000 sq. ft. floor (ceiling) area	1,300	30	570	2,300	52.0	373	1.37
P-6	Install ceiling insulation	Per 100 sq. ft. floor (ceiling) area	300	20	300	600	20.0	210	2.10
P-7	Repair gaps at wall panel joints	Per repair	37	1.0	51	94	30.7	207	20.7
P-8	Replace glazing with insulated pan.	Per 100 sq. ft. area	633	16	261	666	21.6	151	2.16
P-9	Replace glazing with glass block	Per 100 sq. ft. area	810	20.0	600	1,520	17.0	120	0.90
P-10	Repair broken and missing glazing	Per repair	9.00	0.75	12.20	26.50	12.9	31	29.0
P-11	Seal and insulate around window doors	Per double door	127	0.6	112	207	12.7	60.00	3.57
P-12	Repair openings in window doors	Per repair	25	1.0	17.00	62	16.3	105	21.4
P-13	Install glass doors	Per door	00	1.0	17.00	17.00	2.73	15.00	1.46
P-14	Reduce domestic hot water temperature	Per heater	0	0.75	14.00	17.30	1.30	23.00	13.66
P-15	Organize cleaning of floor, frame and glazing	Per 1000 sq. ft. office (increased structural)	0	3.0	23.00	23.00	0.06	6.00	0.06
P-16	Cracking	Per 100 sq. ft. window	1.00	0.5	8.10	10.10	0.10	10.01	10.4
P-17	Sealant around walls	Per 10 sq. ft. wall	0	2	50.20	50.20	1.90	0.02	1.77
P-18	Repair openings in walls	Per 1 sq. ft. opening	3.56	2	31.50	42.07	10.3	70.00	27.6
P-19	Air curtains	Per air curtain	5,200	5	100	6,300	159	616	1.45
P-20	Landfill deck over	Per deck over	600	10	200	1,000	123.2	500	9.22
P-21	Loading deck shutters	Per deck shutter	1,110	15	250	1,610	43.2	177	1.69

SECTION 7

ENERGY PLAN

7.0 MATRIX OF ENERGY SAVINGS

The ECM's investigated were combined to produce five ECIP Projects. These projects are prioritized in Table 7-1 according to decreasing SIR. Their percent energy consumption reduction is also calculated and shown in the last column. Totals for all 5 ECIP Projects are included.

7.1 PREDICTED ENERGY SAVINGS

Figures 7.1, 7.2, and 7.3 graphically represent the energy savings to be realized by the implementation of ECIP projects. Figure 7.1 is a Pie Graph which illustrates the total Community Energy Consumption by fuel type before and after the implementation of the ECIP projects. Figure 7.2 shows the same data as Figure 7.1 in a bar chart format. Figure 7.3 is a Pie Graph that illustrates the total Community Energy Cost, before and after the ECIP projects.

TABLE 7-1

PRIORITIZATION OF ICIP PROJECTS

Priority	ICIP Proj. No.	ICIP Project Name	SIR	Project Cost (\$)	Annual Energy Savings (MBtu/yr)	Annual Energy Cost Savings (\$/yr)	Percent Energy Reduction of FY81 Use = 249,530 MBtu/yr
1	14	Misc. Projects 11	5.6	347,560	26,710.0	151,570	10.7
2	12	Misc. Projects 1	4.4	213,860	14,831.9	74,720	5.9
3	13	Storm Windows	2.5	323,740	12,717.6	56,230	5.1
4	21	Roof Insulation	1.9	651,270	17,410.4	96,000	7.0
5	25	Pipe Insulation	1.1	286,100	4,920.0	20,100	2.0
Totals for All ICIP Projects				1,822,470	76,590.0	398,610	30.7

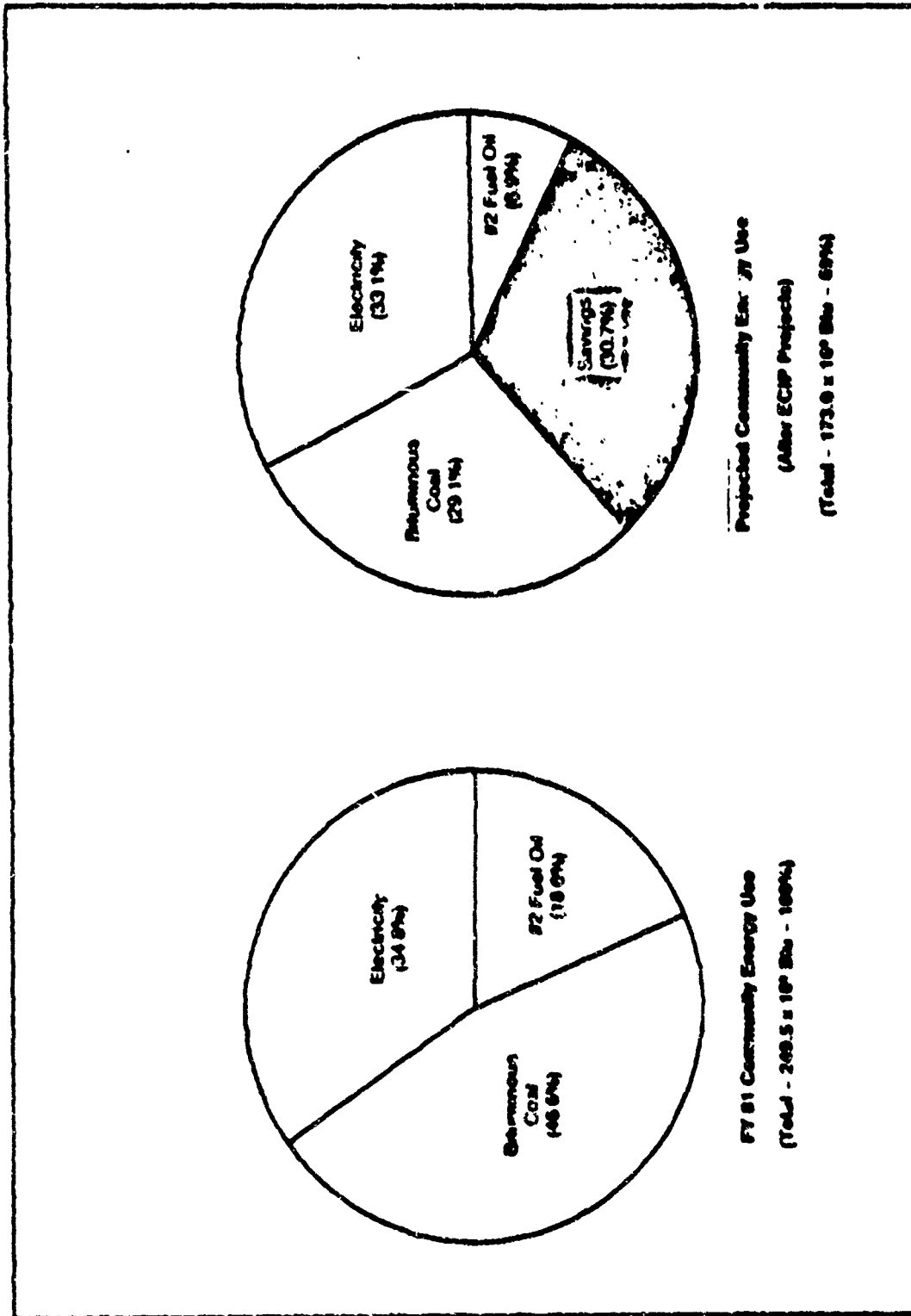


FIGURE 7.1 PHRAISENS MILITARY COMMUNITY (4 INSTALLATIONS IN STUDY)
 PRESENT & PROJECTED COMMUNITY ENERGY USE BY FUEL TYPE
 PIE CHART

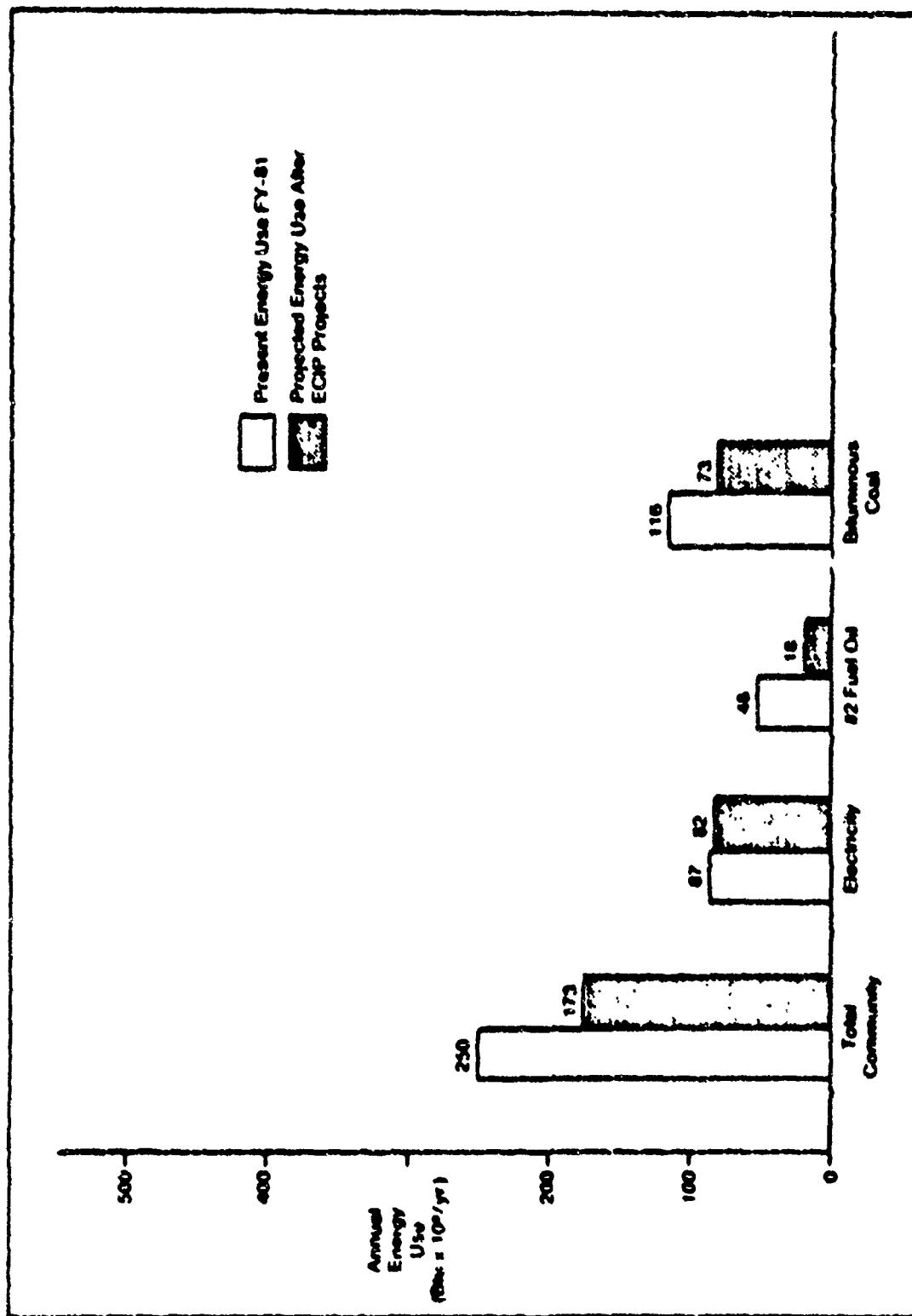
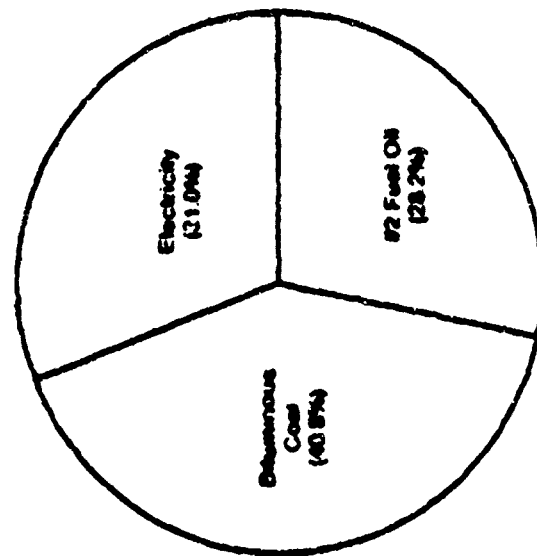
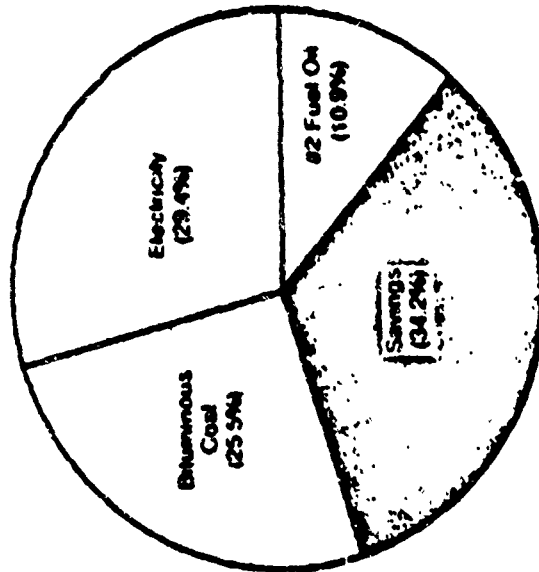


FIGURE 7.2 PIMAASNS MILITARY COMMUNITY (4 INSTALLATIONS IN STUDY)
PRESENT FY81 & PROJECTED ENERGY USE BY FUEL TYPE
BAR CHART



FY 81 Community Energy Cost
(Total - \$1164000 = 100%)



Projected Community Energy Cost
(After ECSP Projects)
(Total - \$765,799 - 65.9%)

FIGURE 7.3 PIMA/SEN'S MILITARY COMMUNITY (4 INSTALLATIONS IN STUDY)
PRESENT & PROJECTED COMMUNITY ENERGY USE BY FUEL TYPE
PIE CHART

SECTION 2

ORGANIZATION OF REPORT

This section has been prepared to provide a comprehensive summary of the organization of this report. It includes a listing of all valid volumes of the report as well as copies of their Tables of Contents. A complete current copy of WESTON's EEAP Package #5 for the Pirmasens Military Community is comprised of the following volumes:

<u>Title</u>	<u>Submittal Date</u>
Preliminary Submittal Volumes I-X	15 February 1982
Volume I - Executive Summary	May 1984
Volume II - Main Report	November 1983
Volume III - Appendix	November 1982
Volume IIIB - Appendix	November 1983
Volume IV - Bundles/1391's	May 1984
Volume V (A-E) EEAP Support Data	November 1982
Increment F	November 1983
Documentation of Computer Analysis	October 1983
Addendum	May 1984

PRELIMINARY SUBMITTAL VOLUMES I - X

The Preliminary Submittal of this report was made in February of 1982 and consisted of 2 volumes. The purpose of this submittal was to present all data gathered during Phase I. Both physical data and operational data on each surveyed building is presented. The organization of the Preliminary Submittal is as follows:

<u>Volume</u>	<u>Installations</u>
Volume I	Munckweiler Hospital
Volume II	Fischbach Ord Depot
	Munckweiler U.G. Storage
	Wormmuelbach Railroad

VOLUME I - EXECUTIVE SUMMARY

The purpose of the Executive Summary is to provide management level information in a concise volume. The most current edition is May 1984. The Table of Contents for this volume can be found on Page 1.

VOLUME II - MAIN REPORT

The Main Report (Narrative Report) contains the basis of analysis and the results of the study. It is a comprehensive volume and was last submitted in November of 1983. All modifications to the November 1983 edition can be found in the Addendum, submitted with the Prefinal Submittal. The following spells out the organization of the Main Report.

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VOLUME III - APPENDIX

Volume III - Appendix was submitted in November of 1982 and has never required updating. Its primary purpose is to provide support data and to that end it contains samples of the computer analysis, Table information used in the computer analysis and copies of the Scope of Work and Minutes of the Pre-negotiation Meeting. The Table of Contents for this volume is as follows:

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VOLUME 111B - APPENDIX

Volume 111B - Appendix, prepared in November of 1983, is a supplement to the original Appendix (11/82). It contains the complete analyses of all conservation opportunities that WESTON evaluated manually. These are primarily specialty opportunities that cannot easily be evaluated by computer. The organization of Volume 111B is as follows:

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VOLUME IV - BUNDLES/1391's

Volume IV - Bundles of this project has been prepared in May of 1984. It contains the complete 1391's for each of the five ECIP Projects prepared for Pirmasens. This Volume has been assembled in a three-ring binder for ease of modification. The organization of Volume IV is as follows:

VOLUME IV - BUNDLES

TABLE OF CONTENTS

TITLE OF SECTION

- Installation of Roof Insulation
- Storm Windows
- Miscellaneous Projects I
- Miscellaneous Projects II
- Pipe Insulation

VOLUME V (A) ECIP SUPPORT DATA

This volume was prepared and submitted in November 1982 and contains the results of each opportunity evaluated for each building. These printouts are contained in a black, three-ring binder and requires no updating. The following indicates the contents of the binder:

<u>Volume</u>	<u>Contents</u>
A	Wall Insulation Roof Insulation Storm Windows Energy Efficient Windows Weatherstrip Windows Weatherstrip Personnel Doors Replace Personnel Doors Weatherstrip Vehicular Doors Flow Restrictors Interior Lighting Conversion Exterior Lighting Conversion

INCREMENT F

The Increment F Submittal of this report was last made in November of 1983. This volume contains data for use by the Facilities Engineer in approaching day-to-day problems. The Table of Contents for Increment F is as follows:

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DOCUMENTATION OF COMPUTER ANALYSIS

This document was prepared at the request of EUD and submitted on a one-time basis. No comments requiring resubmission have been made. The information contained in this volume is as follows:

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<u>SECTION NUMBER</u>	<u>TITLE</u>	<u>PAGE</u>
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ADDENDUM

The Addendum volume has been submitted in May 1984 to update the appropriate pages in the Interim Submittal. It is a one-time submittal. The updated pages will be inserted in their proper locations for the Final Submittal. The Addendum contains inserts for Volume II - Main Report and Volume III - Appendix.